2) Suppose $\begin{cases} f(x) = \dfrac{3x(x-1)}{x^2-3x+2} & \text{for } x \neq 1, 2 \\ f(1) = -3 \\ f(2) = 4 \end{cases}$

Then f(x) is continuous

a) except at $x=1$

b) except at $x=2$

c) except at $x = 0, 1,$ or 2

d) except at $x = 1$ or 2

e) at each real number

$$\frac{3x\cancel{(x-1)}}{x^2-3x+2} \rightarrow (x-2)\cancel{(x-1)}$$

$$\frac{3x}{(x-2)}$$

No calculator.

1) If $g(x) = \frac{1}{32}x^4 - 5x^2$, find $g'(4)$.

a) -72 b) -32 c) -24 d) 24 e) 32

$g'(x) = \frac{1}{32} \cdot \frac{4}{1} \cdot 4^3 - 10 \cdot 4 = \frac{1}{\cancel{128}} \cdot \frac{4}{1} \cdot \frac{\cancel{64}}{1} - 40$

$8 - 40$

$= -32$

$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

2) Evaluate $\lim_{h \to 0} \frac{5\left(\frac{1}{2}+h\right)^4 - 5\left(\frac{1}{2}\right)^4}{h}$.

$\frac{5(x+h)^4 - 5(x)^4}{h}$

$20x^3$

a) $\frac{5}{2}$ b) $\frac{5}{16}$ c) 40 d) 160 e) Limit does NOT exist

$\frac{1}{8} \cdot 20 = \frac{5}{2}$

Robbie

Blair

Farah

Cindy

Nick

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3) An equation of the line tangent to $y = 4x^3 - 7x^2$ at $x=3$ is

a) $y+45 = 66(x+3)$

b) $y = 66(x-3)$

c) $y-45 = 66(x-3)$

d) $y-45 = -\frac{1}{66}(x-3)$

$66(x-3)+45$

e) $y = 66x$

$12x^2 - 14x$

$12(3)^2 - 14(3)$

$108 - 42 = 66$

$4(3)^3$

$4(27) - 7(9)$

$108 - 63$

Calc_Weekly Review 4_0910

1) ***Modeling Data*** The stopping distance of an automobile, on dry, level pavement, traveling at a speed v (kilometers per hour) is the distance R (meters) the car travels during the reaction time of the driver plus the distance B (meters) the car travels after the brakes are applied. The table shows the results of an experiment.

Speed, v	20	40	60	80	100
Reaction Time Distance, R	8.3	16.7	25.0	33.3	41.7
Braking Time Distance, B	2.3	9.0	20.2	35.8	55.9

a) Use the regression capabilities of your calculator to find a linear model for reaction time distance. $R = 0.417v - 0.02$

b) Use the regression capabilities of your calculator to find a quadratic model for braking distance. $B = 0.0056v^2 + 0.001v + 0.04$

$T'(40) = 0.866$ c) Determine the polynomial giving the total stopping distance T.
$T = 0.0056v^2 + 0.418v + 0.02$

$(80) = 1.314$ d) Use your calculator to graph the functions R, B, and T in the same viewing window. graph

$(100) = 1.538$

e) Find the derivative of T and the rates of change of the total stopping distance for $v = 40$, $v = 80$, and $v = 100$. $T'(v) = 0.0112v + 0.418$

f) Use the results of this exercise to draw conclusions about the total stopping distance as speed increases.

2) ***Pendulum*** A 15cm pendulum moves according to the equation $\theta = 0.2\cos 8t$, where θ is the angular displacement from the vertical in radians and t is the time in seconds.

2) ***Pendulum*** A 15cm pendulum moves according to the equation $\theta = 0.2\cos 8t$, where θ is the angular displacement from the vertical in radians and t is the time in seconds.

a) Determine the maximum angular displacement. Explain 0.2

b) Find the rate of change of θ when $t = 3$ seconds. Show work.

$\theta' = -1.6\sin(8t)$

$\theta'(3) = 1.45\ \text{rad/sec}$

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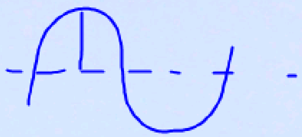
$a = \frac{3.5}{2} = 1.75$ ft

$b = \frac{2\pi}{P}$ $\quad b = \frac{\pi}{5}$



3) ***Wave Motion*** A buoy oscillates in simple harmonic motion $y = a\cos(bt)$ as waves move past it. The buoy moves a total of 3.5 feet (vertically) from its low point to its high point. It returns to its high point every 10 seconds. Use the water's surface as the midline.

$y = 1.75\cos\frac{\pi}{5}t$

a) Write an equation describing the motion of the buoy if it is at it high point at t = 0. (If you need help, see my wiki under Trig → Trig_Basics_Ch3&4 or click the link: http://mrwing.wikispaces.com/file/view/Trig_Basics_Ch3%264_0910.pdf)

b) Determine the velocity of the buoy as a function of t.

$y' = -0.35\pi \sin\left(\frac{\pi}{5}t\right)$

$\frac{2\pi x}{365} - \frac{202\pi}{365}$

4) ***Temperature Change*** The average temperature in Fairbanks, Alaska, during a typical 365-day year is given by the equation $y = 37\sin\left[\frac{2\pi}{365}(x - 101)\right] + 25$ where y is the temperature in Fahrenheit and x is the day of the year.

$y = 37\sin u + 25$

$y = 37\cos u \cdot u'$

$y' = \frac{74\pi}{365}\cos\left[\frac{2\pi}{365}(x-101)\right]$

a) On what day is the temperature increasing the fastest? $y = 37\cos u \cdot \frac{2\pi}{365}$

rate

b) About how many degrees per day is the temperature increasing when it is increasing at its fastest?

- Look at table
- y''

$y'' = -\frac{148\pi^2}{365^2}\sin\left[\frac{2\pi}{365}(x-101)\right] = 0$

$x = 101$

stick 101 in y'

$\approx 0.64°$/day

$\frac{74\pi}{365}$

5) ***Particle Motion*** The position of a particle moving along a coordinate line is $s = \sqrt{1+4t}$, with s in meters and t in seconds. Find the particle's velocity and acceleration at $t = 6$ seconds.

$$v(t) = \frac{1}{2\sqrt{1+4t}} \cdot 4 = \frac{2}{\sqrt{1+4t}}$$

$$v(6) = \frac{2}{\sqrt{1+24}}$$

$$v(6) = \frac{2}{5} \text{ m/sec.}$$

$$a(t) = -4 \cdot (1+4t)^{-\frac{3}{2}}$$

$$a(6) = -4(1+24)^{-3/2}$$

$$= -4 \cdot \frac{1}{125}$$

$$\approx -0.032 \text{ m/sec}^2$$

Weekly Review 5_0910

1) Evaluate each of the following limits algebraically and discuss the continuity of the function including any points of discontinuity.

a) $\lim_{x\to 0} \frac{5x^3+8x^2}{3x^4-16x^2}$

$$\lim_{x\to 0} \frac{\cancel{x^2}}{\cancel{x^2}}\cdot\frac{5x+8}{3x^2-16} \qquad \lim_{x\to 0}\frac{5\cancel{x}+8}{3\cancel{x^2}-16} = -\frac{1}{2}$$

b) $\lim_{x\to 0}(\csc x - \cot x)$

$$\frac{1}{\sin x} - \frac{\cos x}{\sin x} \Rightarrow \frac{1-\cos x}{\sin x}\cdot\frac{1+\cos x}{1+\cos x} = \frac{\sin^{\cancel{2}} x}{\cancel{\sin x}(1+\cos x)}$$

$$\lim_{x\to 0}\frac{\sin x}{1+\cos x} = \frac{0}{2} = 0$$

2) Find $\frac{dy}{dx}$ and the slope of the tangent line at (2, 3).

$$\left.\frac{dy}{dx}\right|_{(2,3)} = \frac{1}{12}$$

a) $x^2+y^2=2y^3 \rightarrow 2x + 2y\frac{dy}{dx} = 6y^2\frac{dy}{dx}$

$$2x = \frac{dy}{dx}(6y^2-2y)$$

$$\boxed{\frac{dy}{dx} = \frac{2x}{6y^2-2y}}$$

b) $xy^2 - y^3 = x^2 - 5$

$$\left(x\cdot 2y\frac{dy}{dx} + y^2\cdot 1\right) - 3y^2\frac{dy}{dx} = 2x$$

$$\frac{dy}{dx}(2xy-3y^2) = 2x - y^2$$

$$\frac{dy}{dx} = \frac{2x-y^2}{2xy-3y^2}$$

$$\left.\frac{dy}{dx}\right|_{(2,3)} = \frac{1}{3}$$

3) Find the equation of the line tangent to the graph of $y=\sqrt{x}$ at the point on the curve where the y-coordinate is exactly one-third the value of the x-coordinate given $x > 0$. Show the work that leads to your answer.

$y = \frac{1}{6}(x-9)+3$

3) Find the equation of the line tangent to the graph of $y = \sqrt{x}$ at the point on the curve where the y-coordinate is exactly one-third the value of the x-coordinate given $x > 0$. Show the work that leads to your answer.

$(9, 3)$

$y = \sqrt{x}$ $y = \frac{1}{3}x$

$y' = \frac{1}{2\sqrt{x}} = m$ of tan $= \frac{1}{6}$

$\frac{1}{3}x = \sqrt{x}$

$\frac{x}{\sqrt{x}} = 3$

$\frac{x^1}{x^{\frac{1}{2}}} = 3$

$x^{\frac{1}{2}} = 3$

$x = 9$

4) Find a value for a so that the function is continuous. Does this choice for a also make the function differentiable? If so, explain, if not, find a value for a that will make the function differentiable at all points.

$$f(x) = \begin{cases} 4 - x^2, & x < -1 \\ ax^2 - 1, & x \geq -1 \end{cases}$$

5) Use composition and the chain rule to show $\frac{dy}{dx} = 6t\sin^2(t^2+5)\cos(t^2+5)$ if $y = [\sin(t^2+5)]^3$. This is an example where you may have three factors involved in the process.